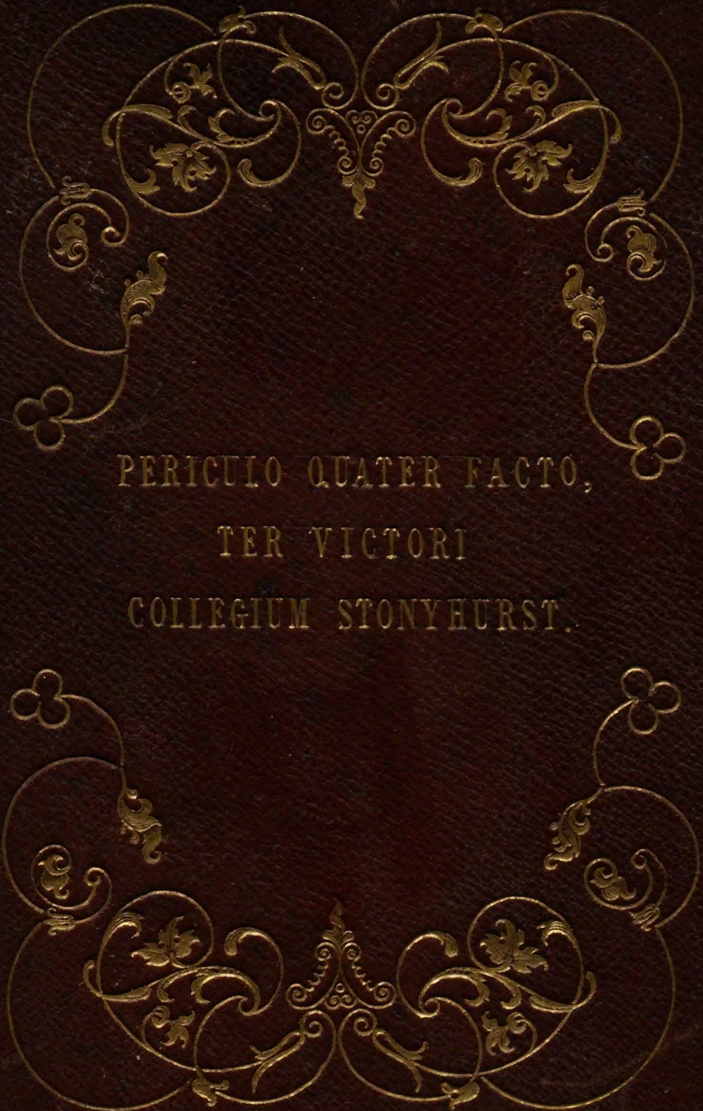

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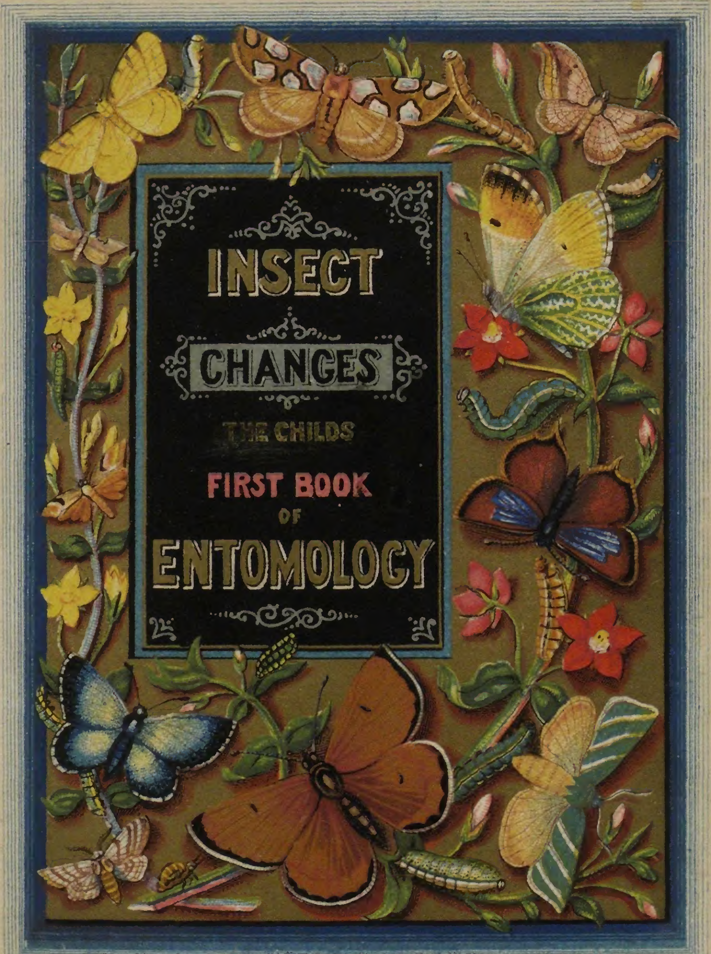

INSECT CHANGES

THE CHILDS

FIRST BOOK

OF

ENTOMOLOGY

ON STONE BY F. BAUER.

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Inſect Changes.

INSECT CHANGES,

AN

Illuminated Present

FOR

YOUTH:

Forming

A FIRST LESSON IN ENTOMOLOGY.

LONDON:
PUBLISHED BY GRANT AND GRIFFITH,
SUCCESSORS TO JOHN HARRIS,
CORNER OF SAINT PAUL'S CHURCHYARD.
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INSECT CHANGES.

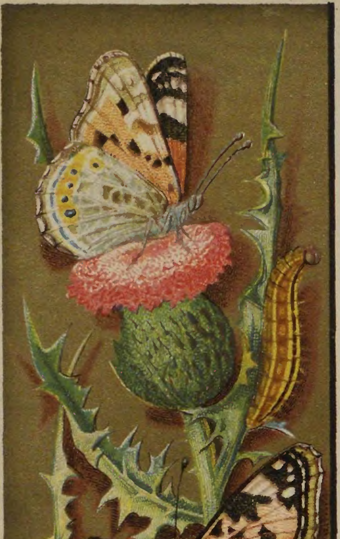
THE Changes of Form that Insects successively assume in their progress to maturity, are so extraordinary, that in the untutored mind, when first called upon to notice them, they must excite the greatest astonishment. The young student of Nature, when first observing these phenomena, can scarcely conceive that the active and reptile-like caterpillar feasting on the graceful foliage of a beautiful plant—the motionless chrysalis, sealed up in its horny case, with no means of changing its place, or taking food—and the glittering bird-like butterfly, gifted with the glorious power of flying, and robbing the honey-cells of various flowers miles apart within a few hours, for its delicious food, can all be one and the same creature, merely in different stages of the same existence: yet, young student, it is true. You will soon, when you begin to learn Latin, read of the wonderful but fabulous metamorphoses of the Heathen gods and goddesses, which the poet Ovid has so elegantly described. These, however, you will know, are only fanciful inventions and superstitions, while the metamorphoses I am about to describe to you are quite as wonderful, and at the same time not fabulous, but perfectly true. They are changes which you may watch with your own eyes; and the domain of Nature contains many things as wonderful, with which you may delight and astonish your understanding, without having recourse to imaginary stories.

In the present little volume I can only explain to you the transformations of some of the most common of our British Moths and Butterflies, but in another I will explain the equally wonderful changes of some other British Insects.

Moths and Butterflies may be said to pass through four very distinct states in their existence: First, that of the egg;—in the most common species the egg is a small object, about the size of a pin's head, which, when deposited by the parent, is generally fixed by a gummy substance to the leaf or stem of the plant upon which the caterpillars, when hatched, are to feed. These eggs are not perfectly round or oval, like the eggs of birds, but flattened at the side attached to the stem or leaf of the plant, and are generally found in groups arranged closely side by side, and covering sometimes great part of a moderately-sized leaf.—The second stage is that of the Caterpillar, which, on first emerging from the egg, is of course very small. The group of young caterpillars generally remain together for a short time upon the same leaf, appearing like so many short pieces of coloured thread in rapid motion; as they grow, and require more food, they generally separate, each travelling off to procure food on his own separate account, though the caterpillars of some species continue to remain together in groups, and are then very conspicuous.—The third state is that of the Chrysalis. The caterpillar when full grown becomes torpid, and by a gradual change, occupying generally from 24 to 48 hours, becomes invested with a horny case, in which the insect is to remain enclosed for periods varying from a few weeks to a year, and in some cases even two years or more. This change, especially in Moths, is frequently effected under ground, the caterpillar burying itself for that purpose.—The fourth, and complete state, is that of the winged insect (the glittering Butterfly), which finally emerges from the dark horny case of the chrysalis.

Thus the career of the insect appears to symbolise that of man—first, in the caterpillar state, creeping over the surface of the earth to obtain the requisite supply of food for its brief existence; then becoming torpid, or dead, and remaining in the earth in its coffin (or chrysalis), eventually to re-appear in a winged or spiritualized state, enjoying a higher and more beautiful existence.

INSECT CHANGES.



THE first of the insect CHANGES which I shall describe, are those of the common CABBAGE-WHITE BUTTERFLY (*Pieris Brassicæ*) and the great SWALLOW-TAIL BUTTERFLY (*Papilio Machaon*), both painted by the illuminator, with their respective caterpillars, on the border of page 7, and those of the PAINTED LADY (*Cynthia Cardui*), with its caterpillar and chrysalis, on page 6.

THE young Naturalist wishing to observe the transformations of the common Cabbage-white Butterfly, may seek for the eggs on cabbages, or the Tropeolum majus, commonly called the Nasturtium, on which plant the eggs are frequently deposited. The voracious and destructive caterpillar of this species feeding greedily upon it; a fact instinctively known it would seem, to the parent butterfly when depositing her eggs upon its leaves, which she does upon this or other plants about the middle of May.

THE eggs very closely resemble a number of white pins' heads laid closely side by side, but when examined with a microscope they appear of a somewhat sugar-loaf form, beautifully carved on the surface, which is of an elaborately ribbed and cross-ribbed pattern of very elegant appearance. By closely watching these eggs day by day, the first transformation may be observed, as they are generally hatched in the morning part of the day, during bright sunshine.

THE minute caterpillars emerge in rapid succession from the eggs, and the leaf is soon covered by their numbers, eagerly engaged in consuming its soft pulpy surface, which at first is their only food, but afterwards, as they gain strength, they devour the tough fibre of the veins also ;

and a brood of them, if not partially destroyed by birds and other enemies, would soon consume an entire plant. They do, in fact, in some seasons, commit great ravages in gardens. Singular changes take place in some species in the caterpillar stage, for they cast their skin several times in the course of their growth; and in one of the species alluded to this skin is black in the early stages, but after the third or fourth shedding they are suddenly clothed in one of rich colours; so that a young entomologist visiting his brood of caterpillars after this operation, would be very much astonished at the metamorphosis, and fancy that his former specimens had escaped, and an entirely new set taken their places, by some extraordinary arrangement, which would be quite above his comprehension, without a knowledge of the true cause of the seeming wonder.

THE caterpillars of the common Cabbage-white Butterfly do not undergo any remarkable change in their colouring or general appearance, exhibiting nearly the same characters of form and colour when small that they retain when they have attained their full growth. To observe the change to the third condition (the chrysalis state), take several nearly full-grown caterpillars, and place them in a gauze cage; or a flower pot, with a little earth at the bottom, and a piece of gauze tied over the top, will answer the purpose equally well. Supply them with fresh leaves of the plant they have been taken from three or four times a day; some of them will soon be observed to cease feeding, and crawl to the side of the cage or flower pot; each spinning a little knot of silk, to which it attaches its hinder feet. It then, in a very singular manner, constructs a girth of silk round the centre of its body, which being attached to the cage or flower pot on each side of the caterpillar, serves to support it in a vertical or upright position during the torpid state, which quickly follows this arrangement, and lasts till the transformation to the chrysalis is effected.

On the student's next visit, he will, after what has been said, fully expect to find a chrysalis, but it is possible he may find a transformation still more wonderful, and in place of either caterpillar or chrysalis, find a heap of forty or fifty little oval balls, or rather cocoons of yellow silk. This metamorphosis appears, no doubt, almost incredible, but when explained becomes very easy of belief, though still exceedingly wonderful, as are a thousand of the beautiful mysteries of Nature, which we pass each day without observation or inquiry. This phenomenon must be explained at once, before we seek further after the chrysalis transformation.—The caterpillar of this species, it has been stated, is exceedingly voracious, and among the many provisions of Nature for preventing its numbers increasing too rapidly, that about to be described is perhaps the most wonderful. There is a small ichneumon-fly, (*Microgaster glomeratus*) which is provided with a sort of weapon termed an ovipositor, or egg depositor, by which it is enabled to pierce the skin of the caterpillar, and deposit an egg in the wound. This operation it repeats forty or fifty times upon the same unfortunate caterpillar, which, however, merely winces slightly under the operation. The wounds heal over, and the eggs so deposited are hatched by the warmth within the body of the victim; but the greater infliction is still awaiting him, for the eggs when hatched become small grubs or maggots, which thus imprisoned, are compelled to feed upon the internal parts of the caterpillar, which they continue to do, instinctively avoiding any positively vital organs, till they are full grown, which happening about the time of the devoted caterpillar slinging himself for change, they finish the consumption of his interior while in a torpid state, and then also prepare for their own change, and weaving their silken cocoons around them, their increase of bulk bursts the skin of the caterpillar, which they have at last left a mere shell, and the heap of silken cocoons appears in his place. Each of these cocoons contains a small oval chrysalis, from which will eventually emerge the perfect fly, to victimise, in his turn, another race of caterpillars.

BUT we have not yet seen the legitimate metamorphosis of this caterpillar of our common White Butterfly. Several others had slung themselves for change about the same time as the unfortunate victim of the ichneumon, and there, in the place of one of them, is that singular object, the proper chrysalis, with its hard angular projections and its minute and delicately dotted marks of pale yellow and brown. Were it not for the same silken girth which holds it, one would never imagine it to be a changed form of the caterpillar whose place it occupies. Instead of the soft and pulpy substance of the caterpillar, here is the horny substance of a shell; and it is as motionless, and apparently as powerless, as a sea-shell from which the animal has been abstracted. But when we touch it we find that it is still endowed with a strong principle of life, for it then moves the tail-like lower portion with considerable vigour. It is, however, a wonderful transformation, the absolute process of which we may watch in another specimen.

WHEN the caterpillar has slung himself by the above-mentioned girth or loop, he gradually becomes shorter and thicker, and then the skin becomes, by degrees, deeper and deeper in colour, till it is nearly black; in the meantime, beneath the skin the change has commenced, and when complete the skin at the head of the caterpillar bursts, and the chrysalis, by continued motion, widens the slit so commenced, and eventually forces this outer coat of the caterpillar downwards, and beneath the loop of silk, until it falls off at the tail, leaving the chrysalis fully exposed. The metamorphosis is complete.

THE last change (that to the perfect or winged state) is now to be observed. The chrysalis remains a chrysalis till some period in July, the immediate time of its change being determined by the warmth of the season. Thus the life of this insect, in its inferior stages, lasts from the middle of May, when it is deposited in the egg, to the middle of July, when it appears as the perfect insect. When the moment arrives for the Butterfly to appear, he bursts his horny bondage within which the new features of his organization have been gradually developing themselves, and creeps forth from his shell. The wings are at first quite small, moist, and closely folded to the body, but they quickly expand and increase, their positive growth being plainly observable, until they are unfolded and of their full size. But they are still quite soft, and useless as a means of flight, till, by an exposure of an hour or more to the air, they become dry and hard, and fit for use, the insect aiding in this drying and hardening process by gradually opening and shutting them, until he feels that they have acquired sufficient force to serve their destined purpose—when, see! he takes flight with the strength and rapidity of a small bird, and roves from flower to flower in search of his sweet food in the nectaries of various flowers. The Butterfly on the border of page 4 is a male, the female of this species being distinguished by two conspicuous black spots on the fore wings: she deposits her eggs in the course of July, which are hatched and pass through the caterpillar to the chrysalis state before the winter sets in. Through the winter they remain in the chrysalis state, and emerge as the perfect Butterfly in May, when the female immediately deposits her eggs to supply the spring brood, as before described.

THE other Butterfly, shown in the border of page 4, is the great Swallow-tail (*Papilio Machaon*), the largest of British Butterflies, specimens being frequently taken in the marshy country near Cambridge, and other places, measuring three inches and three quarters across the expanded wings. The first brood is hatched about June, and when full grown the caterpillars are remarkable for their beautiful markings and the fork-like appendage at the back of the head, from which it is said to emit an odour which keeps off ichneumon flies. The illuminator has shown it in the border of page 7, beneath the Butterfly. It feeds principally on the wild carrot (*Daucus carota*), and attaches itself, for the purpose of change to the chrysalis state, to a small branch of that plant, much in the same way as the caterpillar of the large White Butterfly does to a wall or trunk of a large tree.

WE will suppose the young student has taken a caterpillar of this beautiful insect, and succeeded, by careful treatment, in rearing it so far as the chrysalis state, without knowing what to expect in its winged form. We may conceive his astonishment on seeing the chrysalis burst, and the large and splendid Butterfly come forth, of which the portrait in the border of page 4 conveys a good idea, but is much smaller than even ordinary specimens.*

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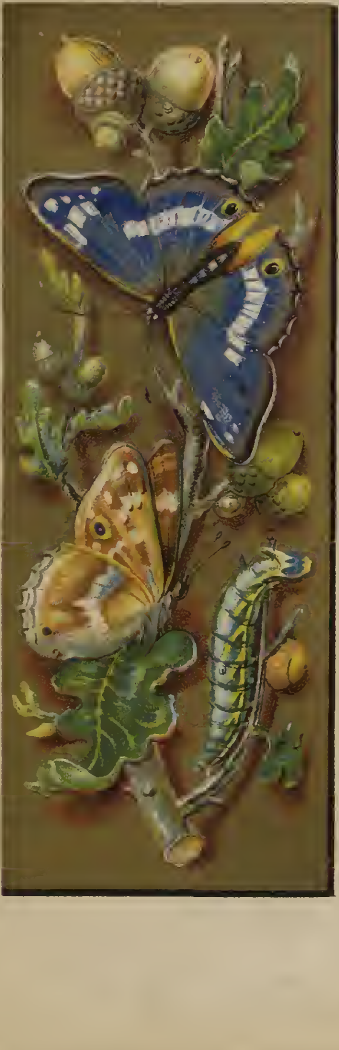
* Chrysalides of this splendid species may be obtained at most of the dealers in Specimens of Natural History, at 1s. 6d. per dozen; the changes of which, the young student might observe without the trouble of *rearing* the caterpillar.

INSECT CHANGES.

THE illuminated border of page 6 contains the transformations of the painted Lady Butterfly (*Cynthia Cardui*), with the caterpillar feeding on the thistle, its most common food. On the flower, the Butterfly is shown with the wings elevated, in order to display the under sides of them, which are marked with even more intricacy and beauty than the upper side, and quite differently both in the distribution of the marks and their colour. In the lower part of the border the same insect is shown with the wings expanded, in the act of flying. The caterpillar is found in the early part of the summer, and is, like others belonging to the same family, covered with singular thorn-like spikes or spines. When about to assume the chrysalis form, it does not sling itself by the middle of the body, like the caterpillars before described, but suspends itself by the tail, in which position the change is effected; and the chrysalis appears as represented in the lower part of the border: the perfect insect issues from it in July.



THE illuminated border of this page exhibits the beautiful Emperor of the Woods (*Apatura Iris*), in the caterpillar and perfect state: the border of the opposite page (15) is decorated, in the upper part, with one of the elegant Chalk-hill Blue Butterflies (*Polyommatus Alexis*), and in the lower part with the Clouded Yellow Butterfly (*Colias Edusa*).

THE Purple Emperor, or Emperor of the Woods, is perhaps the most splendid of our British butterflies, and the great prize sought by collectors. It is usually found in oak-woods, for upon that tree the caterpillar generally feeds. The caterpillar is found in May, and the perfect insect appears in July. The chrysalis much resembles the caterpillar very much shortened and thickened, and still retains the same colour.

INSECT CHANGES.

IT must, indeed, have been a surprise to the first who observed it, to see the magnificent butterfly, glittering in his metallic purple, issue from this horny case, clumsy in shape, and of a sickly green in colour. The under side of the wings of this superb insect differ entirely in colour from the upper, being beautifully variegated with white, gray, rich brown, and orange.

THE metallic purple which renders this insect so splendid is not visible in all lights; in some positions the wings appear of a dull deep brown, but on flying downwards,* and in some other particular lights, the beautiful purple colour appears; which is, however, entirely absent from the females, whose wings are of a change-

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* The illuminator has endeavoured to imitate this effect; the drawing being held downward from the light, shows a stronger blue.

less brown, but marked with the same white marks as those of the male: the female is also larger than the male, and though deprived of his rich purple gloss, is yet a conspicuously beautiful insect, for the deep brown shades in some places into rich orange tones, and in some parts to a light silky tone, verging upon gray. A female showing the under side of her wings, is exhibited in the same border, beneath the male. A well-known collector related to me, that the first time he was fortunate enough to capture one of these beautiful insects, it was a female. It occurred in the following manner:—he had been all the morning hunting, unsuccessfully, about a wood known among entomologists as one in which the Purple Emperor was frequently taken, when a storm coming on, he took shelter under a gigantic oak; he had not been many moments standing in that position, when a most magnificent Emperor, or rather Empress (for it was a female), settled upon the trunk of the same tree, instinctively impelled, no doubt, by the same object as himself—shelter from the impending storm: to prepare his net without disturbing the prize was the anxious but rapid work of an instant; the capture was successfully effected, but the magnificent sp cimen was scarcely deposited in the collecting-box, when a male, no doubt following the flight of the female, settled upon the trunk of the same tree, and slowly closing and expanding his glittering wings, rivetted all the attention of the delighted but embarrassed entomologist, for both his hands were full, not having yet put away the collecting-box, &c.; the slightest movement might alarm, and once on the wing, pursuit is useless; for this robust insect flies with nearly the strength and swiftness of the swallow, and generally at a great height; but skill prevails against instinct, strength, or fleetness; and in a few seconds the Emperor took his place in the box by the side of his already captured Empress. I have seen these two identical specimens, which still form the gems of the beautiful collection of their captor, though he has since been fortunate in obtaining two or three other specimens of this fine species.

IN the lower part of the border of page 15 there is a small caterpillar, so unlike in form to those previously described, that it might, perhaps, rather be taken for a woodlouse of an unusual colour; but yet in its structure it is essentially a caterpillar, which in due time slinging itself closely to a slender branch of the broom, upon which it feeds, becomes a short obtusely-formed chrysalis, shown on the stalk of the wild convolvulus, in the upper part of the same border. From this small and dull-brown chrysalis bursts the sparkling azure butterfly which is commonly found on chalk-hills, especially near the sea, scientifically called Polyommatus alexis. The word Polyommatus signifies many-eyed, in allusion to the numerous eye-like spots that stud the velvety gray of the under side of the wings.

THE other insect in the border of page 15 is the CLOUDED YELLOW BUTTERFLY (*Colias Edusa*), with its caterpillar, shown immediately beneath the wild convolvulus flower, upon which the small Blue Butterfly is settling.

ON the title page the illuminator has exhibited some other specimens of British butterflies in their two most remarkable stages—that of the caterpillar and perfect insect. The one occupying the centre of the bottom border is the beautiful LYCÆNA DISPAR, with its caterpillar immediately underneath to the right. At the lower part of the narrow border is the POLYOMMATUS CORYDON, one of the prettiest of the Chalk-hill Blues, with its small caterpillar; and above it, to the right, is the elegant and plentiful EUCHLOE CARDAMINES, known among collectors as the Orange-tip. Its caterpillar is immediately beneath it.

AMONG foreign butterflies, extraordinary beauties of form and colour, in all their stages, are found; but even among our British species there are many others whose transformations are equally interesting with those just described: but space does not allow of their introduction here, so we must conclude our observations by a few general remarks upon their wonderful changes.

IT was thought, not very long ago, that these changes were positive transformations; that is to say, that the caterpillar positively changed into another creature, which was a chrysalis, and that the chrysalis changed into another distinct creature, which was a butterfly. Some were still more deceived by insect changes, and asserted, that a piece of meat buried in the earth would *change into* green flies. The justly celebrated Swammerdam and Réaumur, and other eminent naturalists, at length undertook to prove that no positive change of one thing into another either did or could take place; and that insects were alone produced from eggs laid by parents of the same species: thus the butterfly can only exist from the egg of a parent butterfly, and the caterpillar, instead of being a distinct insect, contains *rudiments* of all the forms, even the wings, which, farther developed in the chrysalis state, appear quite perfect in the last or complete stage of the insect's existence. The green flies into which the meat was supposed to be transformed, were the produce of the eggs of green flies, which instinctively deposit their eggs on decaying animal matter, upon which alone the grubs or maggots hatched from the eggs can feed. These maggots, on attaining their full growth, become a reddish oval chrysalis, from each of which emerges at last a green fly, which will, in its turn, deposit its eggs in a situation where the larvæ or grubs, when hatched, will find their proper food. Only a short time ago these were all new and astonishing facts, and though they appear so simple when known and proved, they required all the sagacity and long unwearied observation of some of the acutest minds of the last century to discover and prove them.

NOW that they are discovered and proved, they take their place simply enough among other wonderful things concerning the workings of Nature, and find their analogy in all animal life; which always has, in a similar manner, its different stages; in some instances almost as remarkable as those of insect life. For instance—the egg, the downy chicken, and the full-grown and feathered domestic fowl, form three strikingly different phases of existence. But changes in insects are generally more obvious and remarkable; the larvæ, or caterpillar state, being an active and independent existence, is especially remarkable, particularly as it afterwards relapses into a torpid, or second egg state, in the chrysalis. Another feature peculiar to insect changes alone, is, that all growth takes place in the subordinate forms, and that when once the perfect and winged shape is assumed, an insect never grows. Many persons fancy, when observing extremely small flies upon a window, that they are the young of large flies; but this is an error—they are full-grown and fully-developed insects of distinct species; that will lay eggs, which will become small maggots that will change to small chrysalides, from which will emerge perfect small flies, precisely similar, and that will never, in a thousand generations, become any bigger; unless greatly influenced by climate, or some great local cause. For instance, some of those small flies, if taken to a climate that was favourable, by its warmth and moisture, to insect development—as that of Jamaica, though they would not grow themselves, might deposit eggs, which, favoured in the hatching by an extra degree of warmth, might produce more robust insects. For some generations the species might gradually become larger and stronger; but having attained that degree of extra development which the influence of climate could produce, they would again remain stationary, reproducing continually the same race of little flies, a few degrees larger than their ancestors in England.

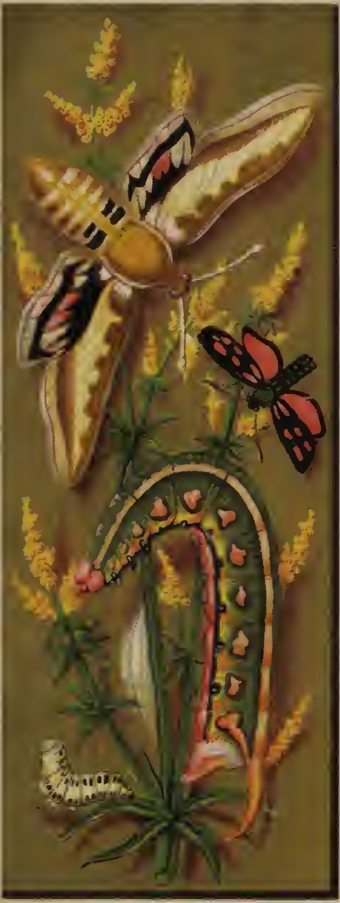
HAVING said all that our space permits on the transformation of butterflies, it remains, perhaps, to make a few general remarks on their characteristics, and on the mode employed in their classification, before we proceed to the Moths.

SOME naturalists insist upon placing this beautiful class of insects at the head of the insect family, and their peculiarities and beauties would seem to entitle them to the preference. The wings, destined to receive the beautiful markings which distinguish them beyond, perhaps, any other examples of animal life, seem augmented to a size disproportioned to the body, for the express purpose of forming a field for the display of those exquisite colours and markings, "as if," says an eloquent writer, "Nature had wished to enlarge the surface upon which she was about to employ her pencil, that it might admit of more varied and profuse decoration." It is from the small coloured scales with which these exquisite designs are, as it were, embroidered upon their wings, that the class of Butterflies and Moths has received its name *Lepidoptera*, from the Greek words *lepis* (a scale), and *ptera* (wings). There are, however, some species which have the wings perfectly free from scales, and they then appear clear and transparent, as those of a fly.

THE grand class Lepidoptera is divided into three families — the *Diurna*, or such as fly by day; the *Crepuscularia*, or such as generally fly at twilight; and the *Nocturna*, or those that fly by night. The first consists of what are generally called Butterflies; the second, of Hawk-moths, or Sphinges (see the border of page 22); and the third, of Moths, or Night Fliers. These classes have other distinctions, independent of their time of flight, which naturally place them together. For instance, the Diurna have wings much larger in proportion to the body than the other classes; and another remarkable distinction is, that their antennæ are terminated by a small snob, or club, which neither the Twilight or Night Fliers possess.

THE Twilight Fliers have these antennæ, or horns, gradually thickening towards the end, and then becoming suddenly pointed; whilst the Nocturna, or Night Fliers, have the antennæ gradually tapering from the root to the point. There are many other distinctions, but these are sufficient to point out to the young student the general principles of classification. It will be sufficient to observe, that the sub-divisions and genera are defined upon similar principles: and as an illustration, we may cite, that the first family of Diurna, or Butterflies, is termed, collectively, *Papilionidæ;* and its grand distinction is, that all its *sub* families and genera have six perfect feet, fitted for walking. The second family of British butterflies (Nymphalidæ) have the front pair of legs so much shortened as to be unfit for walking; in some cases quite rudimental, having no defined foot at the extremity.

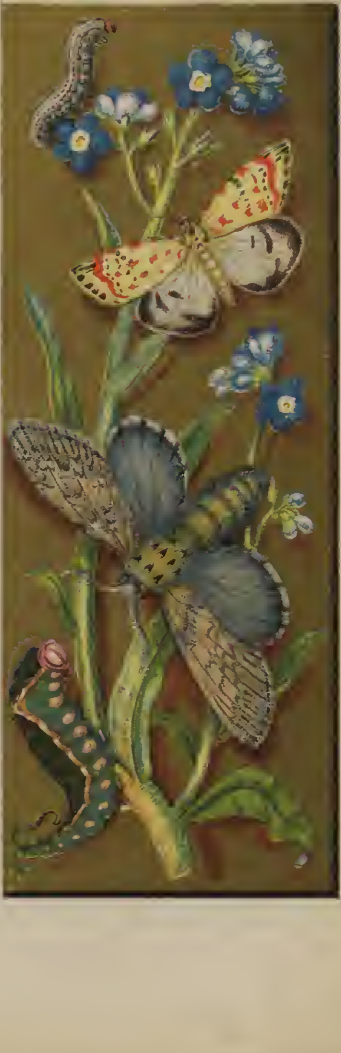
THE habits and forms of the Caterpillars and Chrysalids also form bases of classification; but we must now quit the Butterflies, or division *Diurna*, and examine the Twilight Fliers, which form the link between Butterflies and Moths.



CREPUSCULARIA—HAWK-MOTH

THE large insect wit sharply pointe wings in the uppe part of the borde of page 22 belongs to the clas Crepuscularia; in other words is a HAWK-MOTH (*Deilephila Galii*, the Madder Hawk-moth). The magnificent caterpillar, one of the largest of the British species, is seen in the lower portion of the same border, feeding upon the galium verum (ladies' bedstraw), its most general food. These larvæ, or caterpillars, are found full-grown in September, when they change to the chrysalis form, in which they remain through the winter, the Moth emerging in the following June. This beautiful insect, though rare, is found in many parts of the southern portion of our island, especially in Devonshire, where the still more beautiful Deiliphila Euphorbiæ is found, the caterpillar of which is probably more beautiful than that of any other European species. On the same border (that of page 22), immediately below the large Hawk-moth, is the Six-spotted BURNET MOTH

(*Anthrocera filipendulæ*), also belonging to this division, Crepuscularia, as will be seen by examining its horns, or antennæ, which thicken towards the end, and then become suddenly pointed, as before described. Its small caterpillar is shown in the lower part of the border, and immediately above it is the toughly-woven cocoon, or silken bag, which contains its chrysalis, and fixes it to the stem of the plant on which the caterpillar has fed—generally the Spiræa filipendula.



NOCTURNA—MOTHS.

WE now come to the third great division of Lepidopterous insects, the NOCTURNA, or Night Fliers. The Moth in the lower part of the border of page 23 is the PUSS MOTH (*Cerura vinula*); beneath it is its caterpillar. In the upper part of the same border is the FOOTMAN MOTH (*Deiopeia pulchella*), and above it its caterpillar, feeding on the forget-me-not, on which it is generally found. The Puss Moth is so named from its body being thickly coated with soft hair, which, in its colour and markings, closely resembles the fur of the common tabby cat. Its caterpillar is one of the most singular with which we are acquainted, and generally feeds on the poplar or willow, on which tree it is found about August. Its shape, and the position in which it commonly holds itself, are quite unusual, while its delicate and beautiful tinting of pink and green, and the curious saddle-like mark on the back, combined with its double tail beautifully striped and variegated, render it an object so conspicuous, that no observer of Nature would pass it by unnoticed. Isaac Walton has given a minute account of it in his quaint and delightful manner, and if our young student is tempted to look for it in that author, he will find many other descriptions of natural objects equally interesting and beautiful.

* * *

WATCHING the development of this singular caterpillar, we find that when full grown it forms for itself a cocoon, or case, of chips of wood and bark so firmly gummed together, that it is difficult to open it, even with the assistance of a knife. From the precaution taken to effect this transformation to the chrysalis state in secret and darkness, and from the singular appearance of the caterpillar, one would expect a chrysalis of new and strange form; but in this we are disappointed, for it is a black smooth chrysalis, perfectly similar to those of the great majority of common Moths; and the Moth itself, which appears the following spring, and is not at all rare, presents no singularities of form in accordance with the peculiarities it exhibited in the caterpillar state. There are other examples of similar caprices of Nature in the early stages of Moths. The Moth called the Lobster, for instance, is so termed from the singular appearance of the caterpillar, which is of a deep reddish colour, and shining as if varnished, and has the front legs lengthened in an extraordinary manner, like claws, presenting, on the whole, the appearance of a miniature lobster; but the chrysalis and moth resulting from it, present only the ordinary characteristics of the common species. The **Goat Moth** (*Cossus ligniperda*) is another example. The caterpillar of this species, one of the largest European moths, is a wood borer, and is furnished with powerful jaws suited for his purpose, and the back is fitted with hard plates or scales, one to each segment, which enables the creature to bear the pressure of great weights without injury. His muscular strength also is so great, that in one instance it is recorded to have forced its way from under a glass, although a very large and weighty book (London's Encyclopædia of Plants) was placed upon the top of it. Lyonnet, the great entomological anatomist, who minutely dissected this creature, discovered in it no fewer than 4,061 muscles, while only 529 are known in the human body. The existence of this caterpillar is not the ephemeral life of a few summer weeks, like that of most of his congeners, but lasts *three years*, and yet the eventual results are the same as in common Moths. The chrysalis has no peculiarities, except some hook-like excrescences, which assist it in getting out of the cocoon; and the perfect Moth, presenting no very peculiar features, is only developed to deposit its eggs and die, after a few weeks' existence, like most of the common species. A nearly allied insect, the **Wood Leopard**, so called from its beautifully spotted wings, presents similar characters in its caterpillar stage; but the larva state does not continue so long before the change to the chrysalis.

THE insect called the **Footman Moth** (*Deiopeia pulchella*), in the upper part of the border of page 23, is one of our most elegantly marked Moths, and the caterpillar, in strong contradistinction to the species just described, closely resembles the perfect insect in its markings and colour. Delicate and beautiful in these particulars are both the caterpillar and the perfect insect; and the elegant little plant, Myosotis palustris (the forget-me-not), upon which the caterpillar feeds, seems, from possessing a similar class of beauty, to form its appropriate nourishment; and in grouping them together, the illuminator has felt the beautiful combination of colour and general effect which they thus present.

WE may here describe other species of Moth with which the illuminator has enriched his title page. The Peach Blossom Moth (*Thyatira Batis*) is in the centre at the top; the beautiful pinkish patches, like the scattered petals of a peach flower, having given to it its popular name: its caterpillar, which generally feeds on the bramble, is immediately to the right of it. In the left hand corner of the top is the elegant little Sulphur Moth (*Rumia Cratægata*), so common in our gardens; its caterpillar is partially seen behind it. On the left, at the top, is one of those Moths, the form of whose wings has given them the name of Hooktips: it is called the Pebble Hooktip (*Drepana falcataria*), and immediately beneath is its caterpillar. In the lower corner is a delicate green Moth, popularly called the Green Silver-stripes (*Hylophila prasinana*), and immediately behind it is its caterpillar. Below the Sulphur Moth, on the left, is one of the small Moths, called Cut-wings, from the small hollow in the front of the anterior wings, which appears to have had a piece cleanly cut out. This peculiarity of form one would imagine to result from some partially corresponding singularity of structure in the caterpillar stage; but on the contrary, the caterpillar presents no peculiarity of form whatever, being one of the small spinners which are frequently seen suspended from the leaf of a rose-tree; and many species, it may be observed, which have not the cut-mark in the wing, are also spinning caterpillars in their first stage. Some of the species of these Cut-wings have their specific names *excavana*, alluding to a piece excavated or taken out; others *effractana*, as of a piece broken out.

IMMEDIATELY below the Cut-wing, is the little Moth called the ROSE-PLUME (*Pterophorus rhododactylus*), belonging to a family the wings of which are formed in a totally different manner from those of any other *Lepidopterous* insects; they have less in common with that name than even the transparent-winged species; for in this instance even the groundwork for the scales does not exist, the wing consisting of detached and perfect *feathers*, projecting from the but or shoulder, and thus forming rather a plume than a wing, from which the popular name of the division is derived. The caterpillar is seen immediately above the perfect insect, and presents no unusual peculiarity: thus we see that the strangest caprice of Nature in the perfect insect does not appear foreshadowed in the preparatory stages, and we have previously seen that great variations of form in the caterpillar do not ensure corresponding peculiarities of feature in the perfect insect. Some of this Plume family have a very singular appearance when flying; especially the large White Plume (*Pterophorus pentadactylus*), which flies in the dusk of summer evenings under the shade of old hedges, its slender and most fragile white plumes appearing like the skeleton of a moth, haunting the place of its previous destruction by some greedy bird: one would almost be tempted to call it the Spectre Moth.

IN the extreme lower corner of the left hand of the title border, is a small Moth, which may serve as the representative of a class, having the peculiar characteristic, that the females are *wingless*, and are in many respects so singular in their appearance, that no one, unless previously informed, would imagine them to be Moths at all. The Moth selected as an example of this peculiarity is called the BELTED BEAUTY (*Nyssia Zonaria*), from the yellow belts or zones on the abdomen. The larva is seen behind the Moth, and is a slender green caterpillar, with a yellow stripe above the legs, which eventually becomes a chrysalis of ordinary appearance; but what would be the astonishment of the uninitiated young student, to see, instead of a Moth, a creature without wings, and altogether peculiar and unexpected in its appearance, issue from the case of the chrysalis! This would, indeed, appear a strange metamorphosis; and yet, when closely examined into, it is not altogether so inexplicable, for the rudiments of the wings may be in almost all cases observed. The female is represented to the right of the male. In this instance the difference of the sexes is not so striking as in some others, for the form and colour of the body are similar to those of the male; but in the instance of the very common Vapourer Moth this is not the case, for the body of the male is slender, and of a rich brownish black, while that of the female is four times the size, and nearly spherical, and is profusely furred with soft downy hair of a light gray colour: in short, it is a most singular looking creature, and one well calculated to puzzle a young entomologist.

IN the classification of Moths, similar principles have been adopted to those previously described in alluding to the classification of Butterflies. The genus Hepialus, for instance, is distinguished by having the horns, or antennæ, very short and slender, so much so as scarcely to be noticeable, in some instances, by an indifferent observer. In other genera, or classes, the males have the antennæ toothed like a comb, while in the female of the same species they are simple. In some classes the antennæ of both sexes are simple, and in other cases both slightly pectinated. Other groups are formed by the characteristics of the caterpillars: for instance, the great division Geometridæ is so termed, because the caterpillar, from having no legs in the centre of its body, like those of other divisions, moves forward by bringing the tail up to the head, forming the body into a loop, and then advancing the head till the body is straight, when it brings up the tail again; thus appearing to be measuring, like a geometrician, and from the form taken by the body in this operation they are popularly termed Loopers. Another class is principally characterised by the Tussock caterpillar, so termed from having, along the back, singular tufts of hair, like bunches of floss silk, cut off square, and flat at the top. In another class, not a numerous one, the caterpillars form strange shells, or houses of dead leaves, and such substances, in which the greater part of their body is protected, only leaving out the head and the fore legs to hold by. But such peculiarities belonging to the larva stages do not form such certain aids to classification as points of structure in the perfect insect.

IT may be necessary, in conclusion, to say something of the advantages of classification.

WE might be inclined at first to say, "that Nature does not ticket and label her specimens: then why should we?" But this is not altogether to the point; for we must admit at once, that there is a great advantage derived from every thing having a *name*, in order to prevent the necessity of giving a long description of it each time we have occasion to mention it; for instance, if there was no positive term—such as *knife,* we should be compelled, each time we required such an implement, to describe it as "the piece of steel with a sharp edge, fastened to a handle of ivory, with which we usually cut our food at dinner." Thus the advantage of a positive name is seen.

THE next advantage is derived from arranging such names in groups, according to the characters of the things they represent; so that when we hear of the discovery of a new insect, if we are merely told that it is a Lepidopterous insect, we know at once that it is a Butterfly or a Moth; but if we are further told that it is a Pieris, we then know at once that it is of the same genus as our common Cabbage-White, and having all the leading characters of that insect: in addition to this, the names being formed of Latin and Greek words, their import is known to learned naturalists all over the civilized world; whereas, if they were only English names, they would not be intelligible beyond our own country. Such are a few of the advantages of the existing mode of classification. The system, too, has this advantage, that when understood, it enables you, if you have taken an insect which has never been described before, to name it yourself. Suppose it to be a Butterfly, which, on close examination, proves to have all the leading points of structure, and all the leading markings of our common Cabbage-White, but that it is speckled in an unusual manner, you would pronounce it at once a Pieris, but a new species, which you might name "Pieris punctata," or the Spotted Pieris.

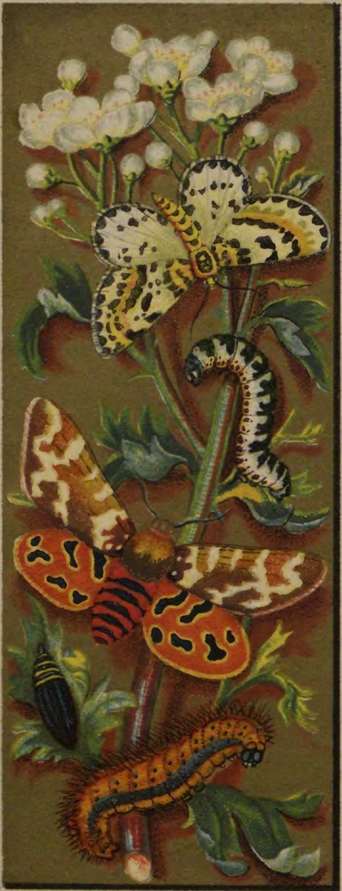
SUCH a name is, of course, merely mentioned as an example, for it is very improbable that our young entomologist will discover any insect in Great Britain of the genus Pieris at all qualified to receive the specific name "Punctata," as distinguishing it from the common species of the genus at present known; which are,—1. *Pieris Brassicæ*, the large Cabbage-white; 2. *Pieris Chariclea*, the early Cabbage-white, a somewhat smaller species; 3. *Pieris Rapæ*, the small Garden-white, scarcely more than half the size of the two preceding species; 4. *Pieris Metra*, called Howard's Small White, closely resembling the preceding species, but having the hind wings of a darker colour on the under side; 5. *Pieris Napi*, the Green-veined White, the hind wings being veined with green on the under side; 6. *Pieris Subellicæ*, differing in the green veining, and other points, from the preceding; and last, *Pieris Daplidicæ*, much larger than the last four species. This rare and beautiful insect, known as the Bath-white, is delicately mottled with black at the angle of the fore wings; and the under sides of both front and hind wings are mottled with deep green.

Accurate portraits of all these species, in their three stages of caterpillar, chrysalis, and butterfly, will be found in Humphrey's and Westwood's "British Butterflies and their Transformations,"—a volume containing similar portraits of every known British species.

I may here mention, that one of the small species above named (Pieris Rapæ), was, in the infancy of British entomology, taken for the young of Pieris Brassicæ; which appears a very ridiculous mistake, now that it is well known that insects, after attaining the perfect or winged state, never *grow*, as explained at page 19.

IN conclusion, we will describe two of our most common, but still most beautiful Moths.

THE lower Moth on the border of page 32, with its caterpillar beneath, is the TIGER MOTH, of the genus Arctia. Arctia is a genus which contains some of the handsomest European Moths; they are all characterised by robust bodies thickly



covered with soft hair, and beautifully striped or spotted. The wings are unusually large and invariably variegated with fine markings of light and dark colouring. The antennæ of the males pectinated (as a comb), those of the females only slightly notched or toothed beneath. The caterpillar is thickly covered with tubercles, from which issue, as it were, long pencils of hairs; from the appearance of which the caterpillar of Arctia caja (our species), is called, by children, a Woolly Bear.

THE beautiful insect placed above, is the CURRANT MOTH (*Abraxas Grossulariata*), which will be seen to belong to the class *Geometræ.* The caterpillar being evidently a Looper, he has just been in the loop position, and is in the act of putting forward his head to another point, up to which he will then advance his tail, forming a loop again, and continuing to progress in this manner.

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ERRATA.

The illuminated border to page 7 has been erroneously referred to in pages 11 and 12 as the border of *page* 4, which must be read as *page* 7.

In the border of page 7, the antennæ or horns of the swallow-tail butterfly have been accidentally omitted.

THE END.

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